EFFICIENT WATER MANAGEMENT CHALLENGES & INITIATION IN PAKUR DISTRICT, JHARKHAND

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Abstract

The management of groundwater resource is concerned with the sustained yield of wells and aquifers, maintaining the balance between discharge and recharge and its quality for optimum utilization in different sectors of economy. The groundwater is more widely utilized and is easily available than surface water in study area due to better aquifer's characteristics. But rapid growth of population, modernization of agricultural activities, use of chemical fertilizers and HYVs altogether has encouraged the over-exploitation of groundwater resources. The Net Groundwater availability of the district is 12684.77 ham. The Gross groundwater draft for all uses of the district is 1713.56 ham. The Net groundwater availability for future irrigation development for the district is 10520.82 ham. Domestic water demand is 0.267 ham, Livestock demand is 0.009815 ham., Net water demand for industries in the current year is 0.1260 BCM and total current water requirement is 0.450 BCM. Therefore, some blocks of the study area have come into the critical category of stage of groundwater development. The main objective of the present study is to assess the groundwater resources of Pakur district which includes the occurrence of groundwater in reference to hydro-geologic conditions, water table characteristics, utilization pattern in different sectors, groundwater quality, estimation of future requirements and management of groundwater resources through conjunctive use of surface and groundwater.

Management of groundwater resources has been discussed in chapter in light of natural and man induced anthropogenic problems associated with groundwater, future requirement assessed for the year 2030 AD, rational use and recharge, minimizing the water losses through different irrigational methods.

***Keywords**: Management, Groundwater, Aquifers, Utilization, Livestock, Hydro-geologic.*

I. INTRODUCTION

Water is an essential element for survival of all biotic worlds and also means of transportation for development of economy for any nation as well as world. So it should be a sustainable development and efficient management for this renewable with limited resource in the nature, so we can fulfill whatever demand of water. The management of groundwater resource is discussed with the support of aquifers, wells, other water bodies maintaining the balance between discharge and recharge and its quality for best utilization in different sectors of economy.

The total annual rainfall in the country has been estimated upto 1170mm.this one with the gross snowfall & glacier melting volume is upto 4000BCM, however only 1869 BCM water availability is due to evaporation& evapo-transpiration.

II. OBJECTIVES

The main objective of the present Paper is asses the water management and challenges and Initiation of water resource in Pakur District which includes the water availability, utilization, management, and challenges of surface and groundwater. In this regards the following are the major objectives of the present Paper:

To study the geologic and physiographical characteristics of the study area influencing the occurrence of groundwater.

- To describe some demographic conditions related to groundwater consumption.
- To assess the groundwater resources of the study area in terms of its present utilization pattern in different sectors of economy..
- To assess the utilization, challenges and management for groundwater in the study area.

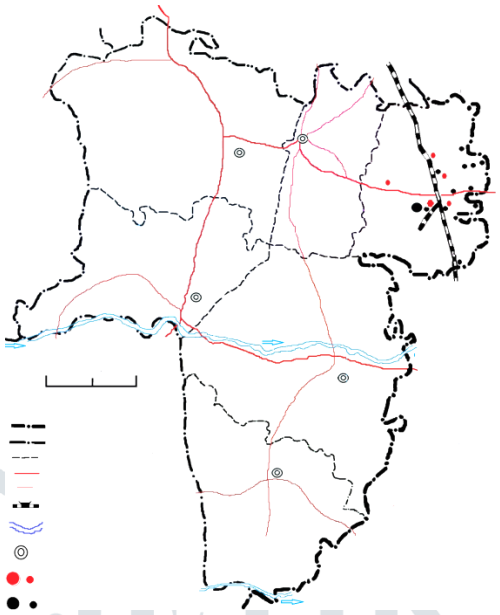
III. METHODOLOGY

This present paper is based on government offices reports, some primary observations, researches conducted by the research scholars, review of related literatures, websites, Published reports and articles by different states, central government, local bodies and NGO's secondary data collected. All data sources have been applied to have a conception of the water conservation and management problem in the study area.

IV. STUDY AREA (PAKUR DISTRICT)

The district Pakur, is located between 21^0 58'N to 25^0 18' N and 83^0 22' E to 87^0 58' E in the north eastern part of the state of Jharkhand, is surrounded by Sahibganj, Dumka, Godda, and state of West Bengal. This hilly district structured by Rajmahal trap's rock type, alluvium, Literate and Gondawana have the geological formation with geographical area of 1805.59 Sq. km. the district posses as 9.00422 lakh population. The district is rich in natural resources like Coal, Forest resource etc. The area and population of district are 2.27% & 2.83% of the state respectively. After the formation of the district in 1994, insufficiency of water is continuously widened, people of the district often desire to settle near water resource of the region. Almost all major rivers became dry in the district most of year shows the scarcity of water. Groundwater level is continuously decreasing due to over exploitation of water in crop producing area in the district. Because of falling groundwater table, people are making deeper hand pump or boring gradually. While recharging rate of underground water is much lesser than withdrawal of water. It is a hilly region and an emerging district, having monoculture (mostly paddy) agriculture. Due to cultivation surface soil continue to be used and degraded, so food grain production is always become lesser than previous year. Area of Agricultural land is also gradually decreasing due to roads, factories, construction of houses and urbanization. Besides the soil degradation and erosion also help to decrease agricultural production. The inflated rate of urbanization and industrialization in the district, water demand has increased for the safe of agriculture, industry, and for urban areas. Therefore the use of this natural resource should be reasonable for enhancing socio-economic condition of this district.

PAKUR DISTRICT BASE MAP



V. GEOLOGICAL FORMATION & HYDROGEOLOGY OF THE AREA

This is 24th district of state of Jharkhand; most part of the district is identified by undulating topography like hilly area, enclosed by basaltic flows of Rajmahal trap. And other geological formation of the district literate, alluvium and gondwana rocks . Eastern part of the district covers alluvium deposit while western part covers Gondwana formation and rest part occurs literates, and some other geomorphological structure like rolling pan plain having ancient ridges and resistant lava plateau of Rajmahal found in southern part. These southern plateau uplift a general height and almost cover all the district. Pakur is largely covered by forest and small hills, a part of parasnath hills spreads in chhotanagpur plateau and Santhal Pargana. So, geographically Pakur has a basaltic trap and sedimentary beds, Quartz and hard rock of granitic gneisses are also found in some parts of the district. And topographically Pakur is divided into the hilly area, the rolling area and the alluvial area of these three parts. The hilly area is made from North corner of the district up to the Southwest border with the state of West Bengal. In the North and North Eastern part of the district, having a narrow strip of alluvial soil, between the Ganga feeder canal and the loop line of Eastern Railway, is very fertile area. And in the last rest part is covered by rolling plain, is less beneficial for agricultural activities. The main rivers flowing are Bansloi, Brahmani, Torai and Gumani in the district.

Groundwater development in hard rock terrain has particular importance. The different geological formation presents multiple groundwater condition in the area. The search for groundwater, its development and management is a significant problem to be considered with. Entire Pakur district, that is Hydro geologically divided into two parts, one is hard rock part and other is soft rock. For getting details of groundwater, some essential information about nature and extent of aquifers, depth, form and slope of water, recharge and discharge of groundwater in relation to morphology is essential. Groundwater in the area is recharged mainly by the atmospheric precipitation. The groundwater is generally not improved by seepage of river water because rivers are discharge in nature. Whereas the fluctuation and depth of water table depends

on geomorpholgical features, Litology and Rainfall. There is 75% part of the district covered by crystalline igneous and metamorphic rocks of Precambrian age. It is seen that in majority, most of the aquifers are formed by hard rocks. literates and reverine sands form good aquifers near river bank, while the Archian and Precambrian covers entire areas, which has very low porosity due to its nature and here permeability is very low. In later through fracture, fissures, joints and weathering of the rocks porosity and permeability is developed. By the hydro-geological view groundwater in any area is controlled by a topographical setting, thickness of weathered zone, size extent, openness and interconnection of joints and fractures. In Pakur 19% of total groundwater and surface water is being utilized for irrigation (TABLE), Industry and other domestic uses. Therefore the combine water management is crucial for sustainable economic development.

District Pakur : Groundwater Utilization in different Sectors 2008-2017

Items	2008-09	2016-17	Percentage change
Area Irrigated (hectare)	63296	64371	4.76
Groundwater utilized (Agriculture)	28008.60	49159.70	56.97
Groundwater utilized (Domestic)	2556.13	5868.16	43.60
Groundwater utilized (Livestock)	791.54	980.69	80.71
Total Volume of Utilized Groundwater	31356.27	56008.55	55.98
Groundwater Use Intensity (per cent)	18.27	32.63	14.36

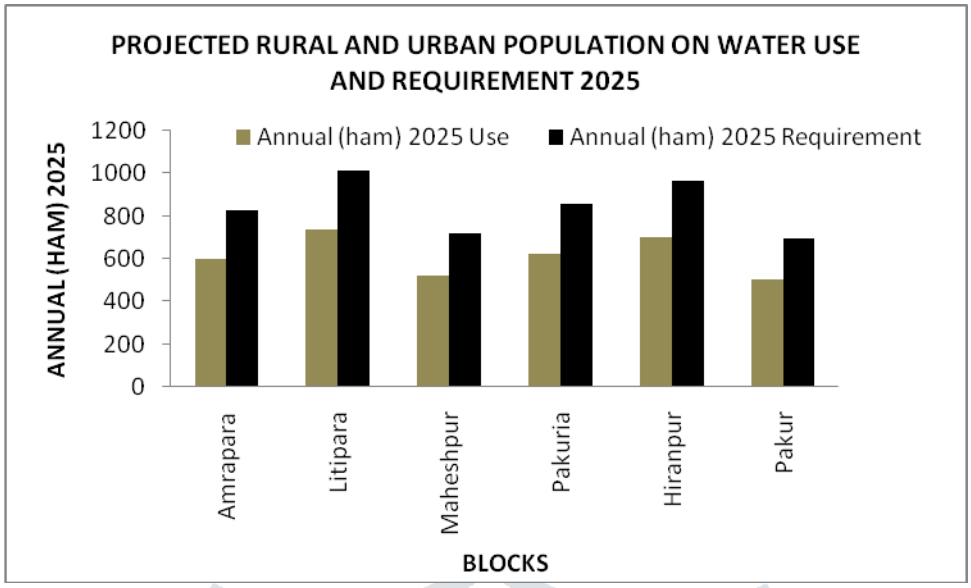
Pakur Irrigation Report 2016. Pakur statistical handbook 2015.

WATER DEMAND OF THE DISTRICT FOR VARIOUS SECTORS (PRESENT):

Based on calculation it reflects that total current water requirement is 0.450 BCM.

Sector	2015	2020	Existing	Gap
Domestic	0.0237	0.0256	0.0213	0.0053
Agriculture	0.1933	0.2884	0.0577	0.2307
livestock	0.0088	0.0098	0.0063	0.0035
Industrial	0.1008	0.1260	0.1008	0.0252
Total	0.3256	0.4509	0.1861	0.2648

Source: District Census Handbook Pakur, (District Irrigation Plan Pakur 2016



Drainage and Water Resource avaibility:

Pakur district receives an annual rainfall of 1399 mm, and maximum rainfall occures during the rainy season. It varies from 2.5mm.-337.8mm., where August month receives maximum and December month receives least rainfall every year from south-west monsoon but here regional distribution is variable on account of the deposition of hill ranges. So the district encounters extreme seasonal variation in monthly rainfall. Humid and sub humid climate is found in the district although a hot dry summer, a good rainy season, and cool winter season is experienced here. The temperature goes high up to 40.70^{0C} during summer and lowest up to 2^{0c} in winter. Here in the district the rainfall, the relief, hill slopes, forests and waste lands cause a significant percentage of surface flow. In this region the geology does not permit heavy infiltration of rainfall because of hard rock terrain. so natural recharging of groundwater is very less about 10-11% of the surface flow. In this district there are three major river basins and other small streams draining out the district's water. The rivers are mostly rain fed.

Here in the district less seepage of groundwater is formed such hard rock terrain. Due to more slopes of streams ensure quick discharge of surface flow. The total surface water available in the district is 12095.15 ham and that is in ''safe'' category in all blocks. Out of which only 1696.37ham. Of water is being utilized for irrigation, drinking water and industries. Thus the district is utilizing only 14.025% of total water resources at present. So the net groundwater availability for future irrigation development for the district is 10970.21ham.

Where as pakur district receives an annual rainfall of 1399 mm. and maximum rainfall occurs during the rainy season. The total surface water available in the district is 12095.15(12651.77) ham. Gross groundwater for all uses is 1713.36 ham and projected demand for domestic & industrial uses up to (2035), 1581.71ham. but out of which only 1696.37 ham of water is being utilized for irrigation, drinking water industries. Thus, the district is utilizing only 14.025% of total water resources at present. Although all available water cannot be fully utilized due to topographical constraints and hydrological features. Development of water resources in the district has revolved largely around for irrigation potential, providing safe drinking water to people, also fulfil industrial demands and also acknowledge environmental problems.

Irrigation

Irrigation is the major issue in this undulating topographic features characteristics of the district. Agricultural activity completely dependent on monsoon rainfall and the kharif crops & maize, paddy are grown mainly. Irrigation facilities are not properly fulfilled dug wells are major common source of irrigation but it is not dependent source because of district is rocky nature.

There is an urgent need to accelerate tackling of balance available irrigation potential through better water management utilize. This is a demanding work. It could be found by interlinking River Ganga by a canal and from mining pits to utilize surplus water and by artificial recharge of groundwater.

Drinking water supply-

The access to safe drinking water sources in urban as well as rural areas of Pakur was 60% in Pakur urban areas while 10% in rural areas. For this a lot more needs to be done for this regard, especially since we aim to achieve the Millennium Development Goal (mdg) of empowered sanitation facilities in the rural areas by the year 2025.

Hydropower-

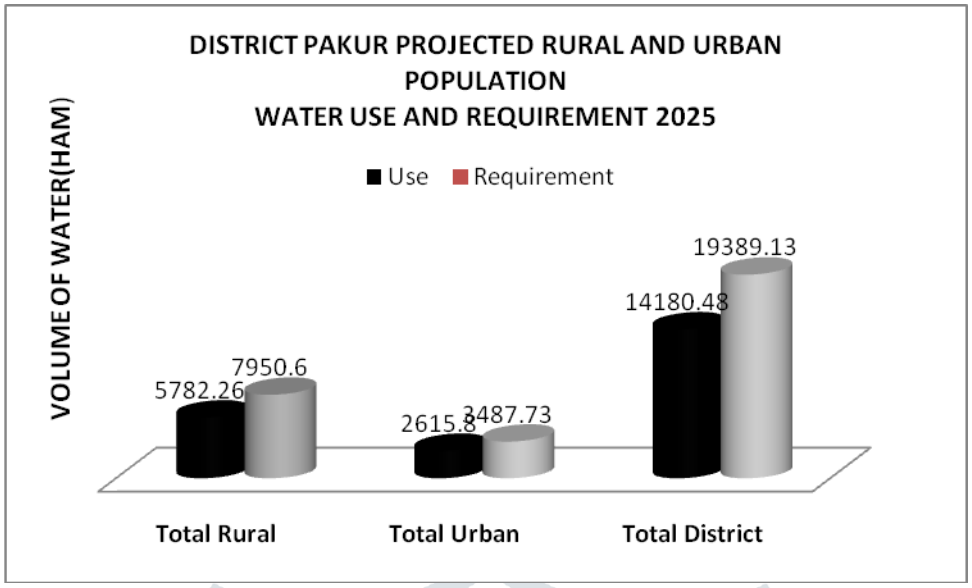
In this region no much availability or any such physical hydrological condition for the production of hydropower.

Flood management -

Northern part of the district is completely flood prone area, while rest parts/ block area provided with reasonable protection through structural measures in approximately all over the area. Along with structural measures efforts have also been made to adopt non-structural measures. There is need for adopting the non structural measures lie flood plain zoning *etc*.

Projections for the future water requirements

The central ground water board has assessed that the gross groundwater draft for all uses of the district is 1713.56 hams. The Net groundwater availability for future irrigation development for the distribution is 10520.82 ham, domestic water demand is 0.267 ham, live stock demend is 0.009815 ham, Net demand for Industries in the current year is 0.1260 BCM and total current water requirement is 0.450BCM. The board has projected /assessed demand for domestic and industrial uses is 1581.71 ham Safer the high demand scenario for next 25 years. Although it is assuming improvement in the efficiency of both surface water and groundwater system and also in the efficiency if water use in agriculture and other sectors . Although the requirement for irrigation water world increase over the time.it share in the overall demand has been estimated to reduce from the present level of about more than 80% to about 70% by the next 25 years.



Challenges in water sector for the district

The water sector in the district is faced with challenges like reducing per capita availability of water due to increasing population, deterioration in quality, over exploitation of ground water resources leading to decline in the groundwater table in many areas of the district, useless utilization of the created facilities and relatively lower efficiency of the facilities for water utilization. The per capita availability of water in 1951 was assessed to be 5177 cubic meter. Now due to population growth, rapid urbanization and industrialization this has come down to about 1650 cubic meter. Unplanned development, and lack of proper laws to govern extraction of groundwater has led to its overexploitation and a resultant decline in groundwater table in many parts of the districts. About 50% of the blocks in the category of over-exploited. Another challenge relates to over-use of surface water which has results in irrigation drainage problem causing water logging in some areas. Pollution of drainage systems like rivers, lakes, ponds etc and deterioration in the quality of ground are well known. A large share of pollution is caused by untreated sewage from the urban areas and effluent from the industry. Excessive use of chemicals, fertilizers and pesticides is also a major cause of pollution. Various reports, data, news etc indicate that there would be more inflation variation for the different time and space, particularly for the extreme flood and draughts. Therefore there is an urgent need for research work for the assessment of the impact of climate change in quantity and for adapting a suitable steps for that.

GROUNDWATER MANAGEMENT AND ITS CONJUCTIVE USE

Water table can be controlled by pumping from wells and preventing water logging in canal irrigated areas. It will reduce land subsidence due to shrinking groundwater levels particularly in confined aquifers.

In projects under conjunctive use of water tube-wells power load can be reduced by replacing it by surface water irrigation during the period of peak power demand. It will ensure in lower power costs.

Crop water requirement can be ensured through out the year by using surface water during the monsoon period and groundwater when surface water is not available.

Efficient water use by properly spaced wells, die to smaller surface distribution system, then canal irrigation scheme. Large subsurface storage at relatively lower cost and quite safe against any risk of dam failures. Water conservation and flood protection can be achieved simultaneously. Sub-surface scheme can be

developed in a shorter period, while it takes 5 to 10 years for completion of a big surface water reservoir. No evaporation and percolation losses and thus, the construction of extensive seepage drains can be avoided. Groundwater and surface water can be mixed in proper proportion to obtain a desired water quality for irrigating more sensitive crops, particularly when groundwater has higher salt concentration. When groundwater has higher salt concentration, only some salt tolerant crops can be grown. Integration of two types of schemes could be obtained with existing water resources without incurring any loss of earlier investment

Management for Water Resource Development in the district

Although water supplies, irrigation, wells, canals, drainage, water storage etc is subject to state government by law. Still central government also continues work with coordination with states for above and resolve their problems and issues related from this. Priority should be given on the timely completion of the irrigation projects through some well planned strategic approach to avoid any difficulties and for maximum utilization of the financial resources.

Participatory irrigation management approach has to be adopted for the sustainability of the irrigation projects. Need based and location specific crops with low water consumption crops to be adopted. Enhancing water use efficiency and adoption of water saving technologies like conservation agriculture, minimization of conveyance losses, suitable cropping pattern. Adoption of scientific irrigation methods is the key to bring more and more area under irrigation facilities. To enhance the water use efficiency in agriculture, increased significance need to be given on the micro irrigation development through drip and sprinkler irrigation. These methods will help to eliminate the conveyance losses of irrigation water and will irrigate proper root area of the crops. There should be attention to be given to use horticultural crops like fruits, vegetables, oily and cash crops like pulses and oil seeds under micro irrigation.

To step up the step of water resources development and recognize the various water related issues. And should implement some important programme and schemes like Accelerated Irrigation Benefits Programme(AIBP), Command Area Development & Water Management(CAD&WM) Programme, Flood Management Programme, Plan for Repair , Renovation and Restoration of Water Bodies etc. A strategy related to the artificial recharge of groundwater through dug wells has also been taken up.

For the time being variation in water availability, there have to spot to various means of conservation of water resources through storage in reservoirs, groundwater aquifers and traditional water bodies. The more variation relating to place to place can be marked through different measures for diverting water from surplus area to deficient regions. Government has already taken up the works related to this National Perspective Plan for interlinking of Rivers which aim at utilizing the surplus flood water by diverting to deficient regions. Government also promotes rainwater harvesting and various means of groundwater recharge etc.

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